UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,283	12/15/2003	Francois-Xavier Musalem	1488/12/2	4294

25297 7590 02/10/2006

JENKINS, WILSON & TAYLOR, P. A.
3100 TOWER BLVD
SUITE 1200
DURHAM, NC 27707

EXAMINER	
DICKEY, THOMAS L	

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 02/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/736,283	MUSALEM ET AL.	
	Examiner	Art Unit	
	Thomas L. Dickey	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *7-53,55-61 and 63-140* is/are pending in the application.

4a) Of the above claim(s) *19,25-45,56,63-79,91-140 and 145* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7-17,20-22,24,46-53,55,57-59,61,80-90 and 141-143* is/are rejected.

7)☒ Claim(s) *18,23,60 and 144* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 May 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.12

1. A request for continued examination under 37 CFR 1.12, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.12, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.12. Applicant's submission filed on 12/13/05 has been entered.

Election/Restriction

2. Applicant is reminded that he elected the embodiment of figures 1-3 in the Paper filed 04/21/05. New claim 145 requires a feature not found in the figure 1-3 embodiment, to wit: "an aperture extending therethrough for ventilating a space between capacitive electrodes." Consequently claim 145 has been withdrawn.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

A. Claims 7-17,20-22,24, 46-53,55,57-59, 61, 141, and 142 are rejected under 35 U.S.C. 102 (b) as being anticipated by DHULER (2001/0036132).

With regard to to claims 7-14, 20-22, 24, and 141, Dhuler discloses a MEMS variable capacitor, comprising (a) first **22** and second **28** actuation electrodes being spaced apart, and at least one **22** of the actuation electrodes being movable with respect to the other **28** actuation electrode when a voltage is applied across the first **22** and second **28** actuation electrodes; (b) a first capacitive electrode **14** attached to and electrically isolated from the first actuation electrode **22**; (c) a second capacitive electrode **12** attached to and electrically isolated from the second actuation electrode **28** and spaced from the first capacitive electrode **14** for movement of at least one **14** of the capacitive electrodes in a substantially straight direction with respect to a normal of a surface of the other **12** capacitive electrode upon application of voltage across the first **22** and second **28** actuation electrodes to change the capacitance between the first **14** and second **12** capacitive electrodes; (d) a substrate **16-32** comprising one or more layers and comprising a first **16** and second **32** (frame supporting moving parts and surving as a substrate to them) portion, the first portion **16** positioned further from the first actuation electrode **22** than the second portion **32**, wherein the second actuation electrode **28** is attached to the first portion **16** of the substrate, and wherein the second capacitive electrode **12** is attached to the second portion **32** of the substrate, said substrate **16-32** attached to the second actuation electrode **28** and the second capacitive electrode **12**; and (e) a plurality of tethers **24** (note particularly the top view of

figure 2) attaching the at least one moveable capacitive electrode **14** to the at least one moveable actuation electrode **22**, the first **14** and second **12** capacitive electrodes to the first **22** and second **28** actuation electrodes, respectively, wherein the tethers **24** are flexible for allowing movement of the capacitive electrodes with respect to one another, the first **22** and second **28** actuation electrodes are composed of a material selected from the group consisting of metal, semi-metal, doped semiconductor, and combinations thereof, wherein the substrate **16** electrically isolates the second actuation electrode **28** and the second capacitive electrode **12**, the first **14** and second **12** capacitive electrodes are composed of a material selected from the group consisting of metal, semi-metal, doped semiconductor, and combinations thereof, the tethers **24** are operable to produce a biasing force to oppose movement of capacitive electrodes with respect to one another and are composed of material selected from the group consisting of silicon, alumina, silica, polymers, and combinations thereof, wherein at least one of the tethers **24** extends substantially perpendicular to a radial direction from about the center of at least one **14** of the capacitive electrodes, at least one of the tethers **24** extends substantially perpendicular to a radial direction from about the center of at least one **22** of the actuation electrodes, and the plurality of tethers **24** include first and second ends, wherein the first end is attached to the at least one movable actuation electrode **22**, wherein the second end is attached to the at least one movable capacitive electrode **14**, and wherein the first and second ends extend in a direction for positioning

the capacitive electrodes closer to one another than the actuation electrodes. Note figures 1 and 2, and paragraphs 0021-0026 of Dhuler.

With regard to to claims 15-17, Dhuler discloses a MEMS variable capacitor, comprising (a) first **22** and second **28** actuation electrodes being spaced apart, and at least one **22** of the actuation electrodes being movable with respect to the other **28** actuation electrode when a voltage is applied across the first **22** and second **28** actuation electrodes; (b) a first capacitive electrode **14** attached to and electrically isolated from the first actuation electrode **22**; and (c) a second capacitive electrode **12** attached to and electrically isolated from the second actuation electrode **28** and spaced from the first capacitive electrode **14** for movement of at least one **14** of the capacitive electrodes in a substantially straight direction with respect to a normal of a surface of the other **12** capacitive electrode upon application of voltage across the first **22** and second **28** actuation electrodes to change the capacitance between the first **14** and second **12** capacitive electrodes; (d) a movable component **18-26** attached to the at least one **22** movable actuation electrode and the movable at least one **14** movable capacitive electrode. Note figures 1 and 2, and paragraphs 0021-0026 of Dhuler.

With regard to to claims 46-53,55,57-59, 61 and 142, Dhuler discloses a MEMS variable capacitor, comprising (a) a movable component **18-26** being movable with respect to a surface of a substrate **16-32** comprising one or more layers and and comprising a first **16** and second **32** (frame supporting moving parts and surving as a substrate to them) portion, the first portion **16** positioned further from the first actuation

electrode **22** than the second portion **32**, wherein the second actuation electrode **28** is attached to the first portion **16** of the substrate, and wherein the second capacitive electrode **12** is attached to the second portion **32** of the substrate, said movable component **18-26** comprising a first **18** and second **26** portion, wherein the first portion **18** is positioned further from the surface of the substrate **16-32** than the second portion **26**; (b) first **22** and second **28** actuation electrodes being spaced apart, wherein the first actuation electrode **22** is attached to the first portion **18** of the movable component **18-26**, wherein the second actuation electrode **28** is attached to the substrate **16-32**, and wherein the first actuation electrode **22** is movable in a substantially straight direction with respect to a surface of a substrate of the second actuation electrode **28** when a voltage is applied across the first **22** and second **28** actuation electrodes; (c) a first capacitive electrode **14** attached to the second actuation electrode **28**; (d) a second capacitive electrode **12** attached to the second portion **26** of the movable component **18-26** and spaced from the first capacitive electrode **14** for movement of the first capacitive electrode **14** with respect to the second capacitive electrode **12** upon application of voltage across the first **22** and second **28** actuation electrodes to change the capacitance between the first **14** and second **12** capacitive electrodes; and (e) a plurality of tethers **24** (note particularly the top view of figure 2) attaching the at least one moveable capacitive electrode **14** to the at least one moveable actuation electrode **22**, the first **14** and second **12** capacitive electrodes, wherein the tethers **24** are flexible for allowing movement of the capacitive electrodes with respect to one another, the first

22 and second **28** actuation electrodes are composed of a material selected from the group consisting of metal, semi-metal, doped semiconductor, and combinations thereof, the first **14** and second **12** capacitive electrodes are composed of a material selected from the group consisting of metal, semi-metal, doped semiconductor, and combinations thereof, the tethers **24** are operable to produce a biasing force to oppose movement of capacitive electrodes with respect to one another, the tethers **24** are composed of material selected from the group consisting of silicon, alumina, silica, polymers, and combinations thereof, at least one of the tethers **24** extends substantially perpendicular to a radial direction from about the center of at least one **14** of the capacitive electrodes, at least one of the tethers **24** extends substantially perpendicular to a radial direction from about the center of at least one **22** of the actuation electrodes, the movable component **18-26** is attached to the at least one **22** movable actuation electrode and the movable at least one **14** capacitive electrode and the movable component **18-26** electrically isolates the at least one **22** movable actuation electrode and the at least one **14** movable capacitive electrode, and wherein the substrate **16-32** attached to the second actuation electrode **28** and the second capacitive electrode **12** and the substrate **16-32** electrically isolates the second actuation electrode **28** and the second capacitive electrode **12**, and the plurality of tethers **24** include first and second ends, wherein the first end is attached to the at least one movable actuation electrode **22**, wherein the second end is attached to the at least one movable capacitive electrode **14**, and wherein the first and second ends extend in a direction for positioning the

capacitive electrodes closer to one another than the actuation electrodes. Note figures 1 and 2, and paragraphs 0021-0026 of Dhuler.

A. Claims 80-90 and 143 are rejected under 35 U.S.C. 102(e) as being anticipated by DE LOS SANTOS (2004/0036132).

With regard to to claims 80-90, de los Santos discloses a MEMS variable capacitor, comprising (a) first 116 and second 112 actuation electrodes being spaced apart, wherein the first actuation electrode 116 is movable with respect to the second actuation electrode 112 when a voltage is applied across the first 116 and second 112 actuation electrodes; (b) a first capacitive electrode 118 attached to the first actuation electrode 116; and (c) a second capacitive electrode 114 attached to the second actuation electrode 112 and spaced from the first capacitive electrode 118 for movement of the first capacitive electrode 118 with respect to the second capacitive electrode 114 upon application of voltage across the first 116 and second 112 actuation electrodes to change the capacitance between the first 118 and second 114 capacitive electrodes, wherein the capacitive electrodes are spaced closer to one another than the actuation electrodes; (d) a movable component 104-106 attached to the at least one 116 movable actuation electrode and the movable at least one 118 capacitive electrode; and (e) a plurality of tethers 110 (note particularly the top view of figure 4) attaching the first 118 and second 114 capacitive electrodes, wherein the tethers 110 are flexible for allowing movement of the capacitive electrodes with respect to one another, the first 116 and second 112 actuation electrodes are composed of a material

selected from the group consisting of metal, semi-metal, doped semiconductor, and combinations thereof,the first 118 and second 114 capacitive electrodes are composed of a material selected from the group consisting of metal, semi-metal, doped semiconductor, and combinations thereof and the tethers 110 are operable to produce a biasing force to oppose movement of capacitive electrodes with respect to one another, wherein the tethers 110 are composed of material selected from the group consisting of silicon, alumina, silica, polymers, and combinations thereof, at least one of the tethers 110 extends substantially perpendicular to a radial direction from about the center of at least one 118 of the capacitive electrodes, at least one of the tethers 110 extends substantially perpendicular to a radial direction from about the center of at least one 116 of the actuation electrodes, and the movable component 104-106 electrically isolates the at least one 116 movable actuation electrode and the at least one 118 movable capacitive electrode, and wherein the movable component 104-106 comprises a first 106 and second 104 portion, wherein the first portion 106 is positioned further from the first actuation electrode 116 than the second portion 104, wherein the first actuation electrode 116 is attached to the first portion 106 of the movable component 104-106, the first capacitive electrode 118 is attached (by way of the first portion 106) to the second portion 104 of the movable component 104-106, and the plurality of tethers 110 include first and second ends (de los Santos does not supply part #s for the ends of his tethers, but it is clear that de los Santo's tethers have ends, insofar as they do not extend indefinitely in both directions), wherein the first end is attached to the first

capacitive electrode 118, wherein the second end is attached to the first actuation electrode 116, and wherein the first and second ends extend in a direction for positioning the capacitive electrodes closer to one another than the actuation electrodes 116,118. Note figures 1-4 and paragraphs 0036-0043 of de los Santos.

Allowable Subject Matter

4. Claims 18,23,60, and 144 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

5. Applicant is thanked for his clear and concise explanation of claims 7 and 46 with reference to figure 2A of the instant application. New art Dhuler 2001/002872's figures 1 and 2 share with applicant's figure 2A the feature that there are at least two points of attachment and at least 2 pairs of moveable (22 in Dhuler's figure 1) and stationary (28 in Dhuler's figure 1) electrodes, arranged symmetrically (note plan view, Dhuler's figure 2) in the plane of the surface of the stationary capacitive (part 12 in Dhuler, "the other capacitive electrode," in claim 7) electrode. This symmetry assures that any force one pair of electrodes (for example the left hand pair 22-28 in Dhuler's figure 1) exerts on the moveable electrode (14 in Dhuler's figure 1) is equal and opposite in the plane of the surface of the stationary capacitive electrode to the force, in said plane, exerted by

another pair (in Dhuler's figure 1, the right hand pair 22-28 of actuation electrodes) of electrodes. Thus the net force on Dhuler's movable capacitive electrode 14 is restricted to the normal to said plane of the surface of the Dhuler's stationary capacitive electrode 12.

As to the details of dependent claims 8-18,47-53,55, and 57-61, Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

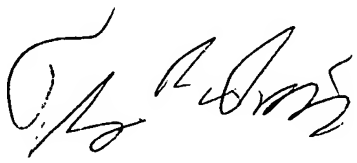
6. With regard to claim 80 Applicant argues that in the device disclosed by de los Santos 2004/0036132, when charges of opposite polarity are applied to actuation electrodes 112-116, the device will move in a first direction so that capacitive electrodes 114-118 are spaced further apart than actuation electrodes 112-116. Applicant ignores the fact that the opposite is also true: when charges of the same (as opposed to opposite) polarity are applied to actuation electrodes 112-116 the device will move in a second direction (opposite to the first) so that capacitive electrodes 114-118 are spaced closer together than actuation electrodes 112-116. Applicant must keep in minds that claim 80 is recited using functional language. To meet claim 80 de los Santos's capacitive electrodes need not actually be spaced apart, they merely need to be capable of moving to a spaced apart location in response to a proper voltage.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Thomas L. Dickey
Patent Examiner
Art Unit 2826
02/06